Project Status

- We have accounts open and authority to spend sPHENIX OPC funds.
- The RLS is integrated and debugged to a significant level (WBS 1.1-1.10)
  - Information for the Project Execution Plan can now be extracted from the RLS
  - WBS 1.11 the INTT will be added shortly
  - WBS 1.12 the MVTA will stand alone since it is an independent upgrade project
- We have a schedule including a critical path analysis
- Have extracted a revised cost estimate from the files
  - Will discuss this at the collaboration meeting tomorrow
- We should have labor profiles available by next week
- Other documents are coming together: CDR, WBS Dictionary, PEP, Haz Analysis Plan, Risk Registry, Risk Management Plan, NEPA, Security docs…

This is in preparation for the Director's Review and CD-1

Revised MIE Cost Estimate as of May 23, 2017

Note that the numbers in both columns are in AY$k. That is better for comparison. Both estimates are for a detector with complete 2π and $-1 < \eta < 1$ coverage. The earlier estimate has 40% contingency. The brand new estimate has 30% contingency. Based on our much better cost information.

The target total MIE w/OH +esc+cont = $29.5 -30 AY$M. Guidance by BNL

Rev May 23, 2017	MIE Costs with OH and esc. No contingency. No Descope. 5/23/17 (AYk$)	MIE Costs with OH and esc. No contingency. No Descope. 1/17/17 (AY$k)
sPHENIX_Project_Management	$1,762	$1,762
sPHENIX_TPC	$3,016	$2,933
sPHENIX_EMCal	$5,896	$4,040
sPHENIX_HCal	$11,714	$6,629
sPHENIX_Calorimeter_Electronics	$5,230	$5,213
sPHENIX_DAQ&Trigger	$1,301	$1,224
sPHENIX_MinBias_Trigger	$136	$108
sPHENIX Total MIE w/ OH & esc (Sum 1.1 to 1.7)	$29,055	$21,909
sPHENIX Total MIE w/ OH & esc & contingency (40% cont1/17/17 & 30% cont 5/23/17)	$37,772	$30,673

CD-1 Preparation and Review Schedule

• Practice for sPHENIX Document Review and Drill Down	Jun 1
• sPHENIX CD-1 “Document Review” w/ BNL Rev committee	Jun 5-6
• Practice for sPHENIX Dress Rehearsal	July 6 – 7 tentative
• sPHENIX MVTX Director’s review	July 10-11
• sPHENIX Director’s Review Dress Rehearsal	July 12-14.
• sPHENIX Director’s Review.	Aug 2-4
• sPHENIX Internal Practice for OPA Review	mid-Sept (propsd)
• sPHENIX External Practice for OPA Review	end-Sept(propsd)
• Additional OPA Review Practice if necessary	mid-Oct(propsd)
• DOE-OPA CD-1 Review	Nov 7-9

Aug 2-4 Director's Review charge

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Managed by Brookhaven Science Associates
for the U.S. Department of Energy

Associate Laboratory Director's Cost & Schedule Review
of the sPHENIX Project
August 2-4, 2017
Charge to the Review Committee

The sPHENIX detector, currently under development, is designed to facilitate large acceptance, ultra-high rate measurements of fully reconstructed jets and high resolution spectroscopy of Upsilon states at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory (BNL). The experiment is aimed at addressing scientific questions prioritized in the 2015 NSAC Long Range Plan and generally enhancing the physics reach afforded by the RHIC complex prior to the possible construction of an Electron Ion Collider (EIC).

The resources for the construction of the sPHENIX detector come from different sources that are essential for its success. The outer tracking system, electromagnetic and hadronic calorimeter together with the trigger and data acquisition system are a DOE Major Item of Equipment (MIE) that was granted CD0 by the Office of Science on September 27, 2016. The MIE component of sPHENIX is preparing for the alternative selection and determination of the project cost range in view of CD-1 and readiness for long lead procurement, scheduled in November 2017. The infrastructure and facility upgrades, including the magnet, and the labor in support for the upgrade are funded through RHIC operations directly. The inner tracking system consists of a silicon strip detector, provided as in-kind contribution by RIKEN and, eventually, a Monolithic Active Pixel Sensor detector that will be part of a separate upgrade proposal to DOE.

The committee is charged to evaluate the sPHENIX plan focusing on cost and schedule for the MIE component, in view of CD-1 and the readiness for long lead procurements. In the event that deficiencies are identified the committee is asked to recommend corrective actions.

1. Is the conceptual design technically sound and likely to meet the objectives of its scientific case? Are the risks understood and is there a R&D plan that mitigates the technical risks?
2. Are the cost and schedule estimates credible and reasonable for this stage of the project?
3. Are the resources needed, including (wo)men-power, adequate and likely to be provided?
4. Is the project appropriately managed? Is there a capable team in place to effectively manage risks, interfaces, and ensure quality?
5. Are the ES&H aspects being properly addressed?

6. Has the project met all CD-1 prerequisites and is ready for CD-1?
7. Is the project ready for long lead procurements and meets the appropriate DOE requirements?

The committee will also be asked to review the infrastructure and facility upgrades and provide recommendations, in a separate report, in case deficiencies are observed.

1. Is the scope adequate to support the scientific goals of the MIE?
2. Are the cost and schedule estimates properly justified and documented?
3. Are the technical risks of this scope reasonable and acceptable?
4. Are the resources needed, including (wo)men-power, adequate and likely to be provided?
5. Are the assumptions and dependencies outside the direct control of sPHENIX project management clearly documented? Have the risks associated with these assumptions and dependencies been identified and possible mitigations documented?
6. Is the management structure and coordination between the MIE, the upgrade facility and the inner detectors appropriate and documented?
7. Are the ES&H aspects properly addressed?

The review will take place from Wednesday to Friday, August 2-4, 2017 at BNL. A closeout will be presented to the sPHENIX project team, and the Laboratory prior to adjourning. Two separate reports should be submitted to my office by close of business on Friday, August 11, 2017.

I very much appreciate your willingness to lend your time and expertise to this important step in the sPHENIX review process, and look forward to receiving your assessment.

Sincerely,

Berndt Mueller
Associate Laboratory Director for Nuclear and Particle Physics
Brookhaven National Laboratory

POB Oversight Charge

Office of the Deputy Director for Science and Technology

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for the U.S. Department of Energy

Memo

Date: May 19, 2017

To: Proposed Project Oversight Board Sub-Panel Members

From: Robert Tribble, Deputy Director for Science and Technology

Subject: sPHENIX Project

On behalf of the Brookhaven National Laboratory Project Oversight Board (POB), I am requesting your assistance in helping to assure a successful Critical Decision 1/Critical Decision 3a (CD-1/CD-3a) Review of the sPHENIX Project.

sPHENIX is proposed as a major upgrade to the PHENIX detector. The sPHENIX detector is optimized to facilitate large acceptance, ultra-high rate measurements of fully reconstructed jets and high resolution spectroscopy of Upsilon states. The outer tracking system, electromagnetic and hadronic calorimeter together with the trigger and data acquisition system are a DOE Major Item of Equipment (MIE) that was granted CD-0 by the Office of Science on September 27, 2016. The $29M-$35M MIE component of sPHENIX is preparing for a CD-1/CD-3a review, scheduled in November 2017. The infrastructure and facility upgrades, including the magnet ($20M) and the labor in support for the upgrade (an additional $20M) are funded through BNL directly. The inner tracking system consists of a silicon strip detector, provided as in-kind contribution by RIKEN and, eventually, a Monolithic Active Pixel Sensor detector that would be part of a separate upgrade proposal to DOE. A bottom-up resource-loaded project plan has sPHENIX assembled, commissioned, and ready to take data in January 2022.

We are asking you to provide your expert advice to help the sPHENIX Project team prepare for a successful Director's Review on August 2-4, 2017 and subsequently a successful CD-1/CD-3a Review in early November of 2017. It is envisioned that this POB Sub-Panel would participate in desk-top documentation reviews, red-team reviews, and dry runs between now and early November as part of this charge.

The initial activity of this charge will be to conduct a detailed review of the documentation that is being prepared by the sPHENIX project team and assess the status of the documentation against the CD-1/CD-3a criteria (attached) as well as the quality of the presentations. If it is deemed by the POB Sub-Panel that the documentation is not quite ready, the Sub-Panel should assess the Project Team's plans to mature the documentation between now and the Director's Review in August. The sub-panel should meet as needed to review information provided by the project team and should provide a report to me by June 15, 2017.

All follow-on POB sPHENIX activities between now and early November will be coordinated between the POB Sub-Panel Chair, Bill Wahl, and the NPP Director of the Office of Project Planning and Oversight, Maria Chamizo-Llatas, in consultation with Ed O'Brien, the sPHENIX Project Manager.

Proposed membership on this sub-panel is:

- Bill Wahl (Chair), LSST Sub-Project Manager
- Jeff Keister, NEXT Deputy Project Manager
- Michael Begel, Group Leader, OMEGA Group
- Flemming Videbaek, STAR iTPC Project Manager
- Mark-Andre Pleier, L2 for ATLAS HL-LHC
- Rajendra Gutta, Project Controls, BNL Project Management Center
- Penka Novakova, Project Controls, DUNE
- Heather Turbush, NSLS-II Business Operations
- George Woods, BNL Procurement

cc: M. Chamizo-Llatas
D. Hatton
D. Lissauer
H. Ma
B. Mueller
E. O'Brien
T. Roser
J. Yeck

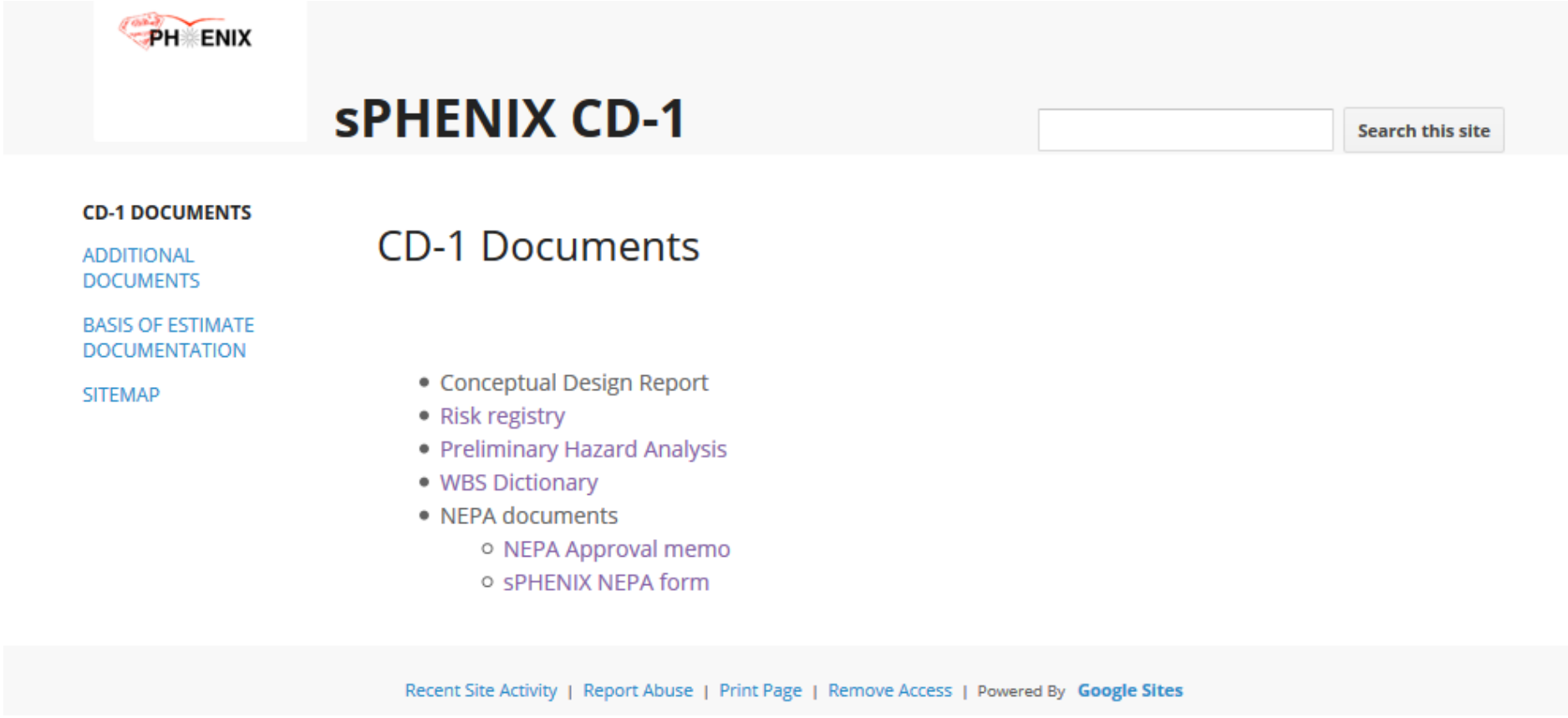
Agenda for the Jun 5-6 Document Review and Drill Down

- Project Overview – Ed O'B
- Technical Overview – John H
- Status of CD-1 Documents – Jim M
- Project Controls Plans – Irina S
- TPC BOE's and RLS _ Tom H
- EMCal BOE's and RLS – Craig W
- HCal BOE's and RSL – John L
- Cal Elec BOE's and RLS - Eric M
- DAQ/Trig BOE's and RLS – Martin P
- Min Bias Trigger Det BOE's and RLS – Mickey C

Drill downs of the L2 files WBS 1.2 to 1.7

Prepping for the Jun 5-6 Documentation Review

John has set up a Google Sites webpage in preparation for the Jun 5-6 review. It is pretty easy to use. For the review we would like our posted documents to be PDFs if at all possible. That means we will need both PDF and docx/xlsx versions of documents in docdb



My Assessment of the BOEs

Good so far but they need a little work:

- Will need to let the review committee see the excel files. PDF versions of the BOEs lose the excel tab structure and links, so PDFs don't seem to be a good option.
- The L2's need to go through their BOEs and remove the external links. Only keep the internal file links. We don't want broken links in our project documentation.
- Add WBS 1.1 Proj Man to BOE
- Fix WBS 1.8 Mag to reflect 4 CAMs. Right now it is all one account
- Make INTT BOEs and add them to docdb

sPHENIX Preliminary Execution Plan

Contents

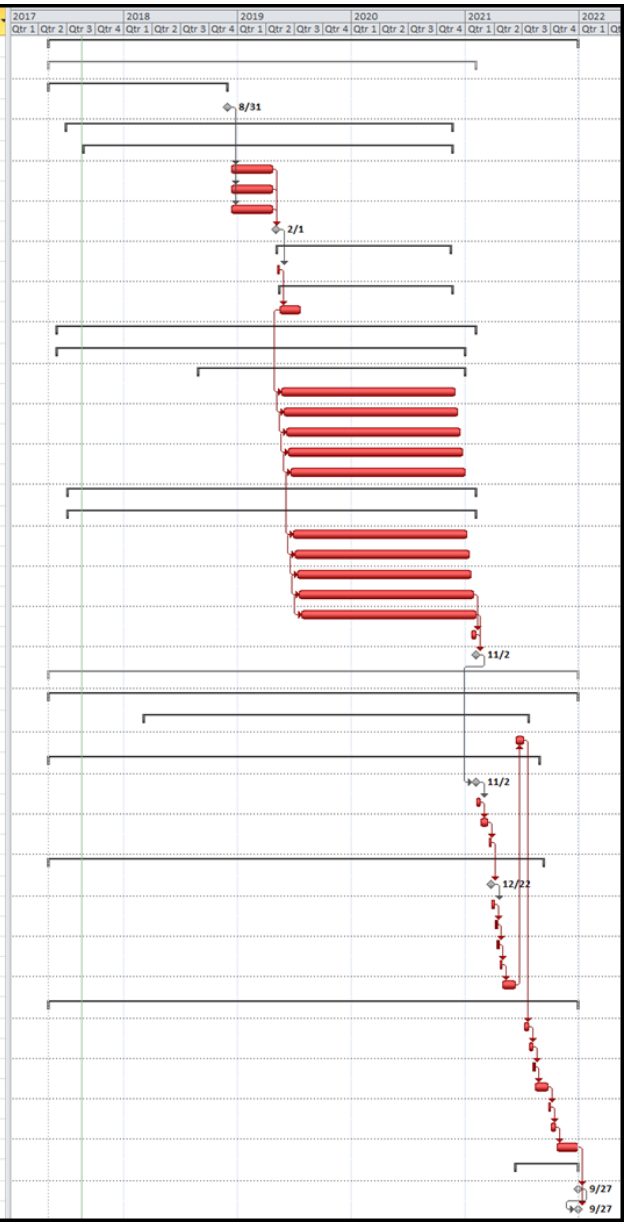
1 Introduction and Mission Need

Add figures and tables based on the Integrated Project files

- **MIE Cost Profile – nearing completion**
- Project Schedule w/ Major Milestones
- Critical path
- **Bottom-up contingency estimate - need**
- Table of High Risks and mitigation plan
- **Labor profile sorted by job category – nearing completion**
- Brief description of each L2 and Control Account

Critical Path Through EMCal Block and Module Production

WBS	Task Name	Duration	Start	Finish
1	sPHENIX_Project	1161 days?	2/1/17	9/27/21
1.3	sPHENIX_EMCal	938 days	2/1/17	11/2/20
1.3.1	EMCAL Management	396 days	2/1/17	8/31/18
1.3.1.5	CD-2b/CD-3b Authorization	0 days	8/31/18	8/31/18
1.3.2	EMCAL Block Production	847 days	3/31/17	8/21/20
1.3.2.3	EMCAL Final Block Production	808 days	5/25/17	8/21/20
1.3.2.3.7	Order & deliver epoxy for final blocks	90 days	9/10/18	1/22/19
1.3.2.3.8	Order parts and fabricate mold parts for final blocks	90 days	9/10/18	1/22/19
1.3.2.3.9	Set up factory for final blocks	90 days	9/10/18	1/22/19
1.3.2.3.12	Readiness and Safety Review for final block production	8 days	1/23/19	2/1/19
1.3.2.3.13	Fabricate final blocks	384 days	2/4/19	8/14/20
1.3.2.3.13.1	Fabricate final blocks sector 1	6 days	2/4/19	2/11/19
1.3.2.3.14	Pack and ship final blocks to BNL	383 days	2/12/19	8/21/20
1.3.2.3.14.1	Pack and ship final blocks for sectors 1-8 to BNL	48 days	2/12/19	4/19/19
1.3.3	EMCAL Module Production and Sector Assembly	919 days	3/1/17	11/2/20
1.3.3.2	EMCAL Module Production	894 days	3/1/17	9/28/20
1.3.3.2.3	EMCAL Final Module Production	583 days	5/29/18	9/28/20
1.3.3.2.3.6	Receive, unpack, log & inspect final blocks	384 days	2/19/19	8/28/20
1.3.3.2.3.7	Install light guides on final blocks	384 days	2/26/19	9/4/20
1.3.3.2.3.8	Install reflectors and mounting supports on final blocks	384 days	3/5/19	9/14/20
1.3.3.2.3.9	Install SiPMs & daughterboards on final blocks	384 days	3/12/19	9/21/20
1.3.3.2.3.10	Glue final blocks together into modules	384 days	3/19/19	9/28/20
1.3.3.3	EMCAL Sector Assembly	896 days	4/3/17	11/2/20
1.3.3.3.3	EMCAL Final Sector Assembly	896 days	4/3/17	11/2/20
1.3.3.3.3.11	Install modules in final sectors	384 days	3/26/19	10/5/20
1.3.3.3.3.12	Install readout electronics on final sectors	384 days	4/2/19	10/12/20
1.3.3.3.3.13	Install cables & cooling system on final sectors	384 days	4/9/19	10/19/20
1.3.3.3.3.14	Test final sectors with LEDs & cosmic rays	384 days	4/16/19	10/26/20
1.3.3.3.3.15	Repair or rework any sectors as required	384 days	4/23/19	11/2/20
1.3.3.3.3.16	Installation Readiness Review	10 days	10/20/20	11/2/20
1.3.4	Install sectors into sPHENIX	0 days	11/2/20	11/2/20
1.10	sPHENIX_Integration_and_Installation	1161 days	2/1/17	9/27/21
1.10.2	Integration Management & Technical Coordination, Installation Tooling & Fixtures & Subsystem Installation	1161 days	2/1/17	9/27/21
1.10.2.2	Infrastructure Installation	841 days	12/4/17	4/20/21
1.10.2.2.3	Install Beampipe/Vacuum/Bakeout	20 days	3/10/21	4/6/21
1.10.2.7	EMCal Installation	1076 days	2/1/17	5/25/21
1.10.2.7.7	EMCal Sectors Ready for Installation	0 days	11/2/20	11/2/20
1.10.2.7.8	Transport Assembled EMCal Sectors to AH	10 days	11/3/20	11/17/20
1.10.2.7.9	Install EMCal Sectors	16 days	11/18/20	12/11/20
1.10.2.7.10	Align/Survey EMCal to SC Magnet Centerline	7 days	12/14/20	12/22/20
1.10.2.8	TPC Installation	1086 days	2/1/17	6/9/21
1.10.2.8.7	TPC Ready for Installation	0 days	12/22/20	12/22/20
1.10.2.8.8	Transport Assembled TPC Sections to AH	5 days	12/23/20	12/31/20
1.10.2.8.9	Install TPC Support	5 days	1/4/21	1/8/21
1.10.2.8.10	Install TPC (Mechanical)	5 days	1/11/21	1/15/21
1.10.2.8.11	Align/Survey TPC to SC Magnet Centerline	5 days	1/19/21	1/25/21
1.10.2.8.12	Install TPC Cables and Services	30 days	1/26/21	3/9/21
1.10.2.11	Min Bias Installation	1161 days	2/1/17	9/27/21
1.10.2.11.9	Install Min Bias Support	10 days	4/7/21	4/20/21
1.10.2.11.10	Install Min Bias (mechanical)	10 days	4/21/21	5/4/21
1.10.2.11.11	Align/Survey Min Bias to SC Magnet Centerline	5 days	5/5/21	5/11/21
1.10.2.11.12	Install Min Bias Cables and Services	30 days	5/12/21	6/23/21
1.10.2.11.13	Review Min Bias for Operational Readiness (ORR)	5 days	6/24/21	6/30/21
1.10.2.11.14	Address Action Items from Min Bias ORR	10 days	7/1/21	7/16/21
1.10.2.11.15	Commission Min Bias	50 days	7/19/21	9/27/21
1.10.2.12	sPHENIX Full Detector Installation	140 days	3/10/21	9/27/21
1.10.2.12.9	All Design/Safety/Readiness Reviews Complete, sPHENIX Ready for Operations	0 days	9/27/21	9/27/21
1.10.9	sPHENIX Ready for Run 1	0 days	9/27/21	9/27/21



WBS Dictionary – Defined to Work Package Level

WBS	WBS	WBS L4	WBS L5	WBS Name	Dictionary Definition
1.1					
1.1				**SPHENIX PROJECT MANAGEMENT**	PROJECT MANAGEMENT FOR ALL SPHENIX WBS ITEMS FROM 1.2 TO 1.10 AND INCLUDING ALL PROJECT STAGES FROM CONCEPTUAL DESIGN TO CD-4 APPROVAL.
1.1	1.1.1			**Project Management of sPHENIX**	COST CONTENT: LABOR COST COVERING THE PROJECT MANAGEMENT TEAM. MATERIAL COSTS FOR TRAVEL OF THE MANAGEMENT TEAM OVER THE LIFE OF THE PROJECT. ADDITIONAL MATERIAL COSTS ASSOCIATED WITH PREPARATION FOR DOE AND BNL REVIEWS. THIS TASK INCLUDES ALL SCIENTIFIC, ENGINEERING, TECHNICAL AND SUPPORT STAFF EFFORTS TO PLAN AND SUPERVISE ALL ASPECTS OF THE ASSEMBLY, INTEGRATION AND INSTALLATION OF THE SPHENIX DEFINED IN WBS 1.2 THROUGH WBS 1.10. WORK STATEMENT: TASKS TO BE PERFORMED BY THE PROJECT MANAGEMENT TEAM INCLUDE: 1) THE OVERSIGHT AND MANAGEMENT OF THE DESIGN, CONSTRUCTION, INSTALLATION AND COMMISSIONING OF SPHENIX , 2) PREPARATION FOR DOE AND BNL REVIEWS INCLUDING CD REVIEWS BY OPA, DOE ANNUAL REVIEW, SAFETY REVIEWS, READINESS REVIEWS, ETC. 3)PREPARATION AND SUBMISSION OF ALL REPORTS AND DOCUMENTATION REQUIRED BY DOE AND BNL INCLUDING CONCEPTUAL AND TECHNICAL DESIGN REPORTS, EARNED VALUE REPORTS, ES&H PLANS, PROCUREMENT PLANS, ETC. 4) MONITORING THE ACTIVITIES OF ALL WBS TASKS THROUGH THE LEVEL2 MANAGERS TO ASSURE ASSURE ADHERENCE TO THE TECHNICAL, BUDGET AND SCHEDULE PLAN OF THE SPHENIX PROJECT. 5)WORK WITH THE LEVEL2 MANAGERS TO MONITOR ALL VENDOR ACTIVITY TO ASSURE COMPLIANCE WITH TECHNICAL, BUDGET AND SCHEDULE SPECS.
1.1	1.1.2			**Travel for sPHENIX Project Management**	TRAVEL TO FACILITATE ACTIVITIES INCLUDED IN WBS 1.1.1
1.2					
1.2				**SPHENIX TPC**	The Time Projection Chamber for the sPHENIX Experiment at RHIC
1.2	1.2.1			**TPC Mechanics**	TECHNICAL SCOPE: THIS ITEM CONTAINS ALL TASKS WHICH ARE REQUIRED TO IDENTITY COMPONENTS FOR THE TPC PROTOTYPE VERSION 1/2, PERFORM R&D, DESIGN AND CONSTRUCT THE ELEMENTS OF THESE PROTOTYPES AND THE FINAL TPC INCLUDING THE HV SYSTEM. WORK STATEMENT: PROVIDE PROTOTYPES: V1/2 FIELD CAGE PROTOTYPE; V1/2 MODULE PROTOTYPING, INCLUDING GAS ENCLOSURE, COMMON MODULE MECHANICS, MODULE PROTOTYPE, V2 FIELD CAGE MODIFICATIONS, SITE PREP FOR PRODUCTION FACTORIES.
1.2	1.2.1	1.2.1.1		**TPC v1 Field Cage Prototype**	TECHNICAL SCOPE: THIS ITEM CONTAINS ALL TASKS WHICH ARE REQUIRED TO IDENTITY COMPONENTS FOR THE TPC FIELD CAGE PROTOTYPE VERSION 1, PERFORM R&D, DESIGN AND CONSTRUCT THE ELEMENTS OF THIS PROTOTYPE.WORK STATEMENT: PROVIDE PROTOTYPE: FIELD CAGE V1 PROTOTYPE.
1.2	1.2.1	1.2.1.2		**TPC v2 Field Cage**	TECHNICAL SCOPE: THIS ITEM CONTAINS ALL TASKS WHICH ARE REQUIRED TO IDENTITY COMPONENTS FOR THE TPC FIELD CAGE PROTOTYPE VERSION 2, PERFORM R&D, DESIGN AND CONSTRUCT THE ELEMENTS OF THIS PROTOTYPE. WORK STATEMENT: PROVIDE PROTOTYPE: FIELD CAGE V2 PROTOTYPE.
1.2	1.2.1	1.2.1.3		**TPC Final Field Cage**	TECHNICAL SCOPE: THIS ITEM CONTAINS ALL TASKS WHICH ARE REQUIRED TO IDENTITY COMPONENTS FOR THE TPC FINAL FIELD CAGE. PERFORM NECESSARY MODIFICATION TO THE V2 FIELD CAGE. WORK STATEMENT: PROVIDE PROTOTYPES: MODIFY V2 FIELD CAGE PROTOTYPE AND TESTING, INCLUDING PROCURING PARTS THAT HAVE BEEN DEVELOPED DURING PROTOTYPING.
1.2	1.2.1	1.2.1.4		**TPC v1 Modules**	TECHNICAL SCOPE: THIS ITEM CONTAINS ALL TASKS WHICH ARE REQUIRED TO IDENTITY COMPONENTS FOR THE GEM READOUT MODULE PROTOTYPE VERSION 1, DESIGN AND CONSTRUCT THE ELEMENTS OF THIS PROTOTYPE. WORK STATEMENT: PROVIDE GEM READOUT MODULE V1 PROTOTYPE AND MATERIAL/EQUIPMENT TO PRODUCE THE MODULES.
1.2	1.2.1	1.2.1.4	1.2.1.4.1	**TPC v1 Module Gas Enclosure**	TECHNICAL SCOPE: THIS ITEM CONTAINS ALL TASKS WHICH ARE REQUIRED TO IDENTITY COMPONENTS FOR THE GAS ENCLOSURE OF A READOUT MODULE PROTOTYPE VERSION 1. WORK STATEMENT: PROVIDE GAS ENCLOSURE FOR A READOUT MODULE V1 PROTOTYPE AND MATERIAL/EQUIPMENT TO PRODUCE THE ENCLOSURE.
1.2	1.2.1	1.2.1.4	1.2.1.4.1	**TPC v1 Module Common Mechanics**	TECHNICAL SCOPE: THIS ITEM CONTAINS ALL TASKS WHICH ARE REQUIRED TO IDENTITY COMPONENTS FOR THE COMMON MECHANICS OF A READOUT MODULE PROTOTYPE VERSION 1, DESIGN AND CONSTRUCT THE ELEMENTS OF THIS PROTOTYPE. WORK STATEMENT: PROVIDE COMMON MECHANICS FOR A READOUT MODULE V1 PROTOTYPE AND MATERIAL/EQUIPMENT TO PRODUCE THE COMMON MECHANICS.
1.2	1.2.1	1.2.1.4	1.2.1.4.2	**TPC v1a Module Prototype**	TECHNICAL SCOPE: THIS ITEM CONTAINS ALL TASKS WHICH ARE REQUIRED TO IDENTITY COMPONENTS FOR THE READOUT MODULE PROTOTYPE VERSION 1A, DESIGN AND CONSTRUCT THE ELEMENTS OF THIS PROTOTYPE. WORK STATEMENT: PROVIDE A READOUT MODULE V1A PROTOTYPE AND MATERIAL/EQUIPMENT TO PRODUCE THE READOUT MODULE.
1.2	1.2.1	1.2.1.4	1.2.1.4.4	**TPC v1b Module Prototype**	TECHNICAL SCOPE: THIS ITEM CONTAINS ALL TASKS WHICH ARE REQUIRED TO IDENTITY COMPONENTS FOR THE READOUT MODULE PROTOTYPE VERSION 1B, DESIGN AND CONSTRUCT THE ELEMENTS OF THIS PROTOTYPE. WORK STATEMENT: PROVIDE A READOUT MODULE V1B PROTOTYPE AND MATERIAL/EQUIPMENT TO PRODUCE THE READOUT MODULE.
1.2	1.2.1	1.2.1.5		**TPC v2 Modules**	TECHNICAL SCOPE: THIS ITEM CONTAINS ALL TASKS WHICH ARE REQUIRED TO IDENTITY COMPONENTS FOR THE GEM READOUT MODULE PROTOTYPE VERSION 2, DESIGN AND CONSTRUCT THE ELEMENTS OF THIS PROTOTYPE. WORK STATEMENT: PROVIDE GEM READOUT MODULE V2 PROTOTYPE AND MATERIAL/EQUIPMENT TO PRODUCE THE MODULES.
1.2	1.2.1	1.2.1.5	1.2.1.5.1	**TPC v2 Module Gas Enclosure**	TECHNICAL SCOPE: THIS ITEM CONTAINS ALL TASKS WHICH ARE REQUIRED TO IDENTITY COMPONENTS FOR THE GAS ENCLOSURE OF A READOUT MODULE PROTOTYPE VERSION 2. WORK STATEMENT: PROVIDE GAS ENCLOSURE FOR A READOUT MODULE V2 PROTOTYPE AND MATERIAL/EQUIPMENT TO PRODUCE THE ENCLOSURE.
1.2	1.2.1	1.2.1.5	1.2.1.5.2	**TPC v2 Module Common Mechanics**	TECHNICAL SCOPE: THIS ITEM CONTAINS ALL TASKS WHICH ARE REQUIRED TO IDENTITY COMPONENTS FOR THE COMMON MECHANICS OF A READOUT MODULE PROTOTYPE VERSION 2, DESIGN AND CONSTRUCT THE ELEMENTS OF THIS PROTOTYPE. WORK STATEMENT: PROVIDE COMMON MECHANICS FOR A READOUT MODULE V2 PROTOTYPE AND MATERIAL/EQUIPMENT TO PRODUCE THE COMMON MECHANICS.
1.2	1.2.1	1.2.1.5	1.2.1.5.3	**TPC v2a Module Prototype**	TECHNICAL SCOPE: THIS ITEM CONTAINS ALL TASKS WHICH ARE REQUIRED TO IDENTITY COMPONENTS FOR THE READOUT MODULE PROTOTYPE VERSION 2A, DESIGN AND CONSTRUCT THE ELEMENTS OF THIS PROTOTYPE. WORK STATEMENT: PROVIDE A READOUT MODULE V2A PROTOTYPE AND MATERIAL/EQUIPMENT TO PRODUCE THE READOUT MODULE.
1.2	1.2.1	1.2.1.6		**TPC Production GEM Acquisition**	TECHNICAL SCOPE: THIS ITEM CONTAINS ALL TASKS WHICH ARE REQUIRED TO ACQUIRE COMPONENTS FOR THE GEM FOILS AND PRODUCE THESE FOILS, INCLUDING THE TRAINING OF A TECHNICIAN DEDICATED TO THE PRODUCTION OF SPHENIX GEM FOILS. WORK STATEMENT: PROVIDE ALL PARTS AND MANPOWER TO PRODUCE THE FINAL GEM FOILS.
1.2	1.2.1	1.2.1.7		**TPC High Voltage System**	TECHNICAL SCOPE: THIS ITEM CONTAINS ALL TASKS WHICH ARE REQUIRED TO IDENTITY COMPONENTS FOR THE HIGH VOLTAGE SUPPLY SYSTEM FOR THE GEM READOUT MODULES AND CENTRAL MEMBRANE. IC CONTAINS THE TASKS TO PROCURE THE ELEMENTS OF THESE ITEMS. WORK STATEMENT: PROVIDE ALL PARTS TO PRODUCE A HIGH VOLTAGE SUPPLY SYSTEM FOR THE TPC.
1.2	1.2.1	1.2.1.8		**TPC Assembly**	TECHNICAL SCOPE: ASSEMBLY OF FINAL TPC. WORK STATEMENT: ASSEMBLE ALL PARTS AND PRODUCING THE FINAL TPC.

Risk Registry

sPHENIX Risk Registry

Owner	WBS	Risk Name	Risk trigger (if)	Consequences (then)	Timeframe	Probability	Impact	Rank	Mitigation Plan
E. O'Brien	1.1 Management	Departure of Key Personnel	Someone critical to the Project informs of his intention to leave sPHENIX	Schedule delay occurs	all	10%	Schedule: 3 months	Low	Closely work with sPHENIX collaboration to identify a potential replacement.
E. O'Brien	1.1 Management	Safety Incident	Safety incident resulting in injury	Schedule delay occurs	all	5%	Schedule: 1 month	Low	Carefully plan all work in accordance with BNL SBMS. Include safety reviews and safety review recommendations implementation in sPHENIX resource loaded schedule.
E. O'Brien	1.1 Management	Funding profile stretches	Funds not available on time	Cost increases because procurements need to be broken down into smaller units, or existing quotes expire, or new contracts need to be negotiated.	production	50%	Schedule: 12-24 months Cost: $500K	High	Work closely with the funding agency so any funding profile changes can be evaluated as early as possible and sPHENIX Project schedule optimally adjusted to match the new funding profile.
E. O'Brien	1.1 Management	Infrastructure support delayed	Infrastructure milestone is delayed	Project activities dependent on infrastructure milestone are delayed	all	5%	Schedule: 2 months	Low	Develop a detailed resource loaded schedule with key milestones for infrastructure support and closely monitor this schedule for risk triggers.
T. Hemmick	1.3 TPC	Procure v1a GEMs				Low	Low	Low	In case the proper GEMs for the v1a prototype are not in hand, an adapter plate will be requires to fit an existing GEM-stack to allow the magnet test to proceed.
T. Hemmick	1.3 TPC	Performance failure of v2 prototype				Low	Moderate	Moderate	We will add a design cycle of a smaller device than the full sized field cage if the v1 prototype fails. We will proceed on v2 only after success of the small version.
T. Hemmick	1.3 TPC	Failure or delay of CERN production				Low	High	Moderate	We will monitor carefully the success of CERN foil production and will hire a technician who will exclusively work on producing GEM foils for our project. If delays still occur, we will seek a second vendor (e.g. Tech Etch).
T. Hemmick	1.3 TPC	SAMPA Chip Failure				Low	High	Moderate	ALICE and STAR shall be forced to mitigate the situation and if not, alternatives such as the nALTRO and DREAM chips must be considered.
S. Stoll	1.3 EmCal	Loss of W powder supplier	Failure of the primary supplier (Tungsten Heavy Powder) to provide a quote for full powder order at an affordable price or will not sign a contract with BNL to deliver	Would need to obtain quote and contract with different supplier for powder. This will cause a delay in the schedule and possibly an increase in cost. In addition, powder from a different vendor could lead	production	Low 20%	High cost: price increase > $500k. schedule: 9 mo to relist/negotiate contract/ place	Moderate	Find another source of W powder which can meet our specs. Some have already been investigated. Attempt to identify primary source of raw powder in China and identify new distributor. Accept degraded detector performance if new powder does not meet specs.
S. Stoll	1.3 EmCal	Loss of SciFi supplier	Failure of fiber vendor to sign contract or deliver fiber on time.	Would cause a delay in the schedule and result in higher cost for the fiber	production	Moderate 30%	Moderate cost: $1.4M higher cost for alternate supplier	Moderate	Two suppliers have been identified. We believe both can meet our specs, but one is roughly 2X high cost. If lower priced supplier cannot deliver then we must use contingency to purchase from other supplier.
S. Stoll	1.3 EmCal	Loss of primary production site for blocks (University of Illinois Urbana Champaign	UIUC decides to not fabricate the absorber blocks	Would cause a delay in schedule and a significant increase in labor resources required to build the blocks at BNL.	production	Low 20%	High cost: schedule: 12 mo. Delay	Moderate	Blocks would have to be built at BNL. However, we would also lose scientific oversight provided by UIUC, student labor, free use of facilities, space, etc.
S. Stoll	1.3 EmCal	Cannot find cost effective solution for making light guides	R&D studies and beam tests do not lead to improvements in the light collection uniformity from the modules	Will require position dependent correction for obtaining the desired energy resolution from the detector	R&D phase	Moderate 60%	Low - scope: possibly reduced energy resolution.	Low	We will have optical quality injection molded light guides produced with what we believe will be the optimal shape given the space constraints of the detector. The resulting energy resolution will be measured in a beam test.
J. Lajoie	1.4 HCal	Loss of scintillating tile provider (Uniplast)	Uniplast is unable to engage in or complete the production contract	Schedule delay in the procurement of the scintillating tiles, along with correspond delays in inner and outer HCAL assembly.	production	10%	Schedule: 6-9 months	Moderate	Explore alternate scintillator vendors (FNAL, Elgin, IHEP).
J. Lajoie	1.4 HCal	Unable to produce inner HCAL in SS310 in a cost effective manner	Evaluation of inner HCAL prototype yields higher than anticipated production costs	Schedule delay in finalizing the design of the inner HCAL; re-engineering required.	production	25%	Schedule: 6 months	Moderate	Investigate value-engineering designs and alternate materials (brass); will require re-engineering.
J. Lajoie	1.4 HCal	Unable to identify suitable site(s) for inner HCAL assembly (scint. and electronics)	No participating University site can identify the space resources for assembly.	Schedule delay to set up assembly site at BNL	production	5%	Schedule 3 months	Low	Investigate possibility of assembly (scintillator and electronics) at BNL
E. Mannel	1.5 Cal Electronics	Delay in SiPM Delivery	SiPM order not placed on schedule or vendor unable to meet production schedule	Delay in assembly of Hcal and EMCal SiPM daughter boards. Potential delay in Hcal and EMCal module assembly	Procurement	Moderate: 50%	Low: Schedule delay 2-3 months	Low	Closely monitor the procurement stage.
E. Mannel	1.5 Cal Electronics	Delay in testing of SiPMs	SiPM Delivery not placed on schedule or vendor unable to meet production schedule	Delay in assembly of Hcal and EMCal SiPM daughter boards. Potential delay in Hcal and EMCal module assembly	Production	Moderate: 50%	Low: Schedule delay 2-3 months	Low	Increase number of testing stations. Identify additional collaborators who can contribute to the testing program. Streamline testing program.
E. Mannel	1.5 Cal Electronics	Delay in Assembly of HCal Daughter boards, Preamps, Interface boards, LED Drivers	Procurement of components, issuing of orders.	Potential delay in HCal module assembly and testing	Production	Moderate: 25%	Low: Schedule delay 2-3 months	Low	Staged partial deliveries of boards. Use multiple assembly houses
E. Mannel	1.5 Cal Electronics	Delay in assembly of EMCal Daughter boards, Preamps or Interface boards	Procurement of components, issuing of orders.	Potential delay in EMCal module assembly and testing	Production	Moderate: 25%	Low: Schedule delay 2-3 months	Low	Staged partial deliveries of boards. Use multiple assembly houses
M. Purschke	1.6 DAQ/Trigger	DAQ Prototype		DAQ prototype throughput and performance is below specifications				Low	Acquire more expensive PCs / re-design parts of the architecture
M. Purschke	1.6 DAQ/Trigger	Network switch		Network switch more expensive than projected				Low	try to use "software" switch / cascading of cheaper, smaller switches
M. Purschke	1.6 DAQ/Trigger	Global L1L1		adaptation of PHENIX GL1 runs into obstacles				Low	select different card, re-design parts of the architecture
M. Purschke	1.6 DAQ/Trigger	Timing System		Conversion/adaptation from GLINK problematic, or envisioned				Low	select different card, re-design parts of the architecture
M. Purschke	1.6 DAQ/Trigger	Local LVL1		Performance of LL1L1 algorithms inadequate. Trigger latency too				Moderate	prioritize Physics goals, procure more hardware

Defining the Preliminary Key Performance Parameters

- **Meeting with DOE-ONP and BHSO June 7 Lloyd to discuss our preliminary KPP's. My proposal:**

Preliminary KPP's

The preliminary KPP's are the minimum parameters against which the project performance is measured at CD-4 project completion.

System	Parameters	Preliminary KPPs
Time Projection Chamber	Operations	90% live channels based on laser, pulser, cosmics
Electromagnetic Calorimeter	Operations	90% live channels based on LED, cosmics
Hadronic Calorimeter	Operations	90% live channels based on LED, cosmics
Min Bias Trigger Detector	Operations	90% live channels based on laser. Bench demonstration of 50 ps/ch timing resolution
DAQ/Trigger	Event rate	5-10 kHz w/ laser, LED, pulser
DAQ/Trigger	Data Logging rate	10-20 GBit/s with laser, LED, pulser

- **Installation isn't necessary to meet all of these KPP's.**

Back Up

Documents To Be Available Prior to the CD-1 Director's Review

1. Acquisition Strategy - Not yet complete
2. Conceptual Design/Conceptual Design Report – Advanced design/ advanced draft
3. Preliminary Project Execution Plan – Draft by next week
4. Preliminary Hazard Analysis Report- Draft
5. Preliminary Risk Management Plan – Advanced Draft
6. Preliminary Risk Assessment and Risk Registry – Advanced Draft
7. Preliminary Security Vulnerability Assessment (Short security equipment protection & cyber security) - Draft of Equip protection. Cyber security doc in process.
8. Alternate Analysis – For the PEP includes scientific alternatives Not yet started
9. Management Organization - complete
10. Cost Range (Cost Books)
11. WBS (WBS Dictionary)
12. Activity List & Activity Attributes
13. Critical Milestones
14. Project Schedule
15. Proposed Funding Profile
16. Contingency Risk/Analysis

A team of 20-25 people have been working on this for the past 4+ months. All derived from WBS MS-Project file
By sPM, L2s, CAMs and engineers

17. Integrated Safety Management Plan - Pro forma
18. NEPA form - complete
19. Close all previous review recommendations – sPM, L2s

CD-1 Preparation and Review Schedule

- **sPHENIX CD-1 "Document Review" with BNL internal Review committee (Jun 5-6)**
  - **Review state of the documentation, Project files with drill down, project controls**
  - **Project Overview talk, Project Controls talk, Documentation overview , MIE L2 documentation overview, MIE L2 Drill down.**
  - **We will need a practice week of May 29, either Jun 1 or 2. Expect to have draft agenda this week. I am working with Maria on the agenda and committee.**
- **sPHENIX MVTX Director's review (Jul 10-11)**
  - **At BNL. External committee. Combined CD-0/CD-1 review**
- **Dress Rehearsal w/ external committee for sPHENIX Director's Review July 12-14 (2 of 3 days)**
- **sPHENIX Director's Review. (Aug 2-4)**
  - **Jay Marx will chair.**
- **DOE-OPA CD-1 Review (Week of Nov 6)**
  - **2.5 days. 1 day of plenary. 1 day of breakout. ½ day of report writing and close out**
  - **Practice 2 weeks prior to the review with follow-up one week prior. I will schedule.**